INSTRUCTIONS

FOR

WESTON

MODEL 798 TYPE 2

Proportional Mutual Conductance Tubechecker

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WESTON ELECTRICAL INSTRUMENT CORPORATION
NEWARK 5, NEW JERSEY, U.S.A.

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DESCRIPTION

GENERAL: The Model 798 Vacuum Tube Analyzing equipment consists of a vacuum tube and voltage regulator tester mounted in one complete assembly and housed in a welded aluminum case. The case is equipped with a hinged cover storage compartment with separate sections, one for the accessories and one for spare parts.

ACCESSORIES: One Black Top Connector Grid Lead for Tube Testing

One Red Top Connector Plate Lead for Tube Testing

One Line Cord equipped with a Double Fused Plug (this line cord is permanently attached)

METER RANGES: The tube tester section of the 798 has the following ranges:

0 to 3000 micromhos
0 to 6000 micromhos
0 to 12000 micromhos
(A Good-Bad scale is also provided)

The voltage regulator section uses the meter as a 200 volt d-c voltmeter for all voltage regulator tests.

ACCURACY: The tube testing section is rated with an accuracy of 15% for all mutual conductance ranges and 2% for the voltage regulator section.

POWER REQUIREMENTS: 115 volts 60 cycles, single phase, alternating current, 30 watts.

METHOD: Of the many measurable characteristics of a vacuum tube, the mutual conductance is the one most closely associated with operating performance. For this reason, the factor which determines the end of useful life of vacuum tubes is generally taken to be the mutual conductance except in the case of diodes which have no grids, and other tubes in which the mutual conductance is not conveniently measured. The factor which determines the end of useful life of these latter tubes is generally taken to be cathode emission current measured under specified conditions.

The Model 798 equipment indicates mutual conductance by measuring the 5 kilocycle alternating current produced in the plate circuit by a 5 kilocycle signal applied to the grid of the tube under test. This grid signal may be varied in three steps providing three mutual conductance ranges. Since mutual conductance involves the ratio of the value of alternating plate current to the value of the alternating grid signal which produced that plate current, it is evident that the instrument which measures the 5 kilocycles component of the plate current may be calibrated in terms of micromhos of mutual conductance instead of microamperes of alternating current.

In the Model 798, all electrode potentials are applied to the tube under test at a frequency equal to that of the power line nominally 60 cycles. In other words the heater, grid, screen, plate, and suppressor voltages applied to the tube under test previous to the application of the grid signal, are supplied from a single power transformer.

This device operates on a differential frequency system, wherein a much higher frequency is used for the grid signal potential. This signal frequency is 5 kilocycles, and the signal potential is supplied from an oscillator or signal voltage generator which operates only when the G_m signal switch is pulled. The potential for this signal voltage generator is supplied from the power transformer, and therefore, it actually operates only during the half-cycle of power line potential when the plate of the signal voltage generator tube is positive. Thus, 5 kilocycle signal pulses are supplied from the signal voltage generator tube to the grid of the tube under test in the Model 798. These pulses produced every 1/60 of a second are phased so that the pulse is applied to the grid of the tube under test, during the negative excursion of its grid potential. They are superimposed on this grid potential or grid bias. In this way we have a measured bias potential and a measured signal voltage applied in the test grid circuit.

The instrument indicating the condition, or mutual conductance of the tube under test is connected in a low pass filter network wherein a 60 cycle plate current will not cause an instrument indication. Thus, when a tube is plugged into the socket and allowed to warm up, the meter will not indicate normal plate current.

When the G_m signal switch is operated, the 5 kilocycle signal pulses are supplied to the grid of the tube under test, and the meter in the low pass filter network indicates the higher frequency component of plate current resulting from the applied 5 kilocycle signal voltage. If we designate this current component i_p and the signal voltage as e_g then the well-known relation between this current and voltage is:

$$i_p = e_g \times g_m$$

where g_m is the mutual conductance (transconductance) then:

$$g_m = \frac{i_p}{e_g}$$

if, therefore, the signal voltage is maintained at a constant value by the line check adjustment, the instrument may be calibrated directly in terms of mutual conductance. For example if the G_m range switch is indexed to the correct position for a value of one volt, and the summation of the current through the meter circuit and its associated shunt resistor is adjusted for three milliamperes, the full scale deflection on the instrument would correspond to 3000 micromhos; that is:

$$g_m = \frac{0.003}{1} \times 1,000,000 = 3,000$$

POTENTIALS: The power transformer supplies all of the necessary potentials, and is metered at all times. A suitable line voltage adjustment is available for correction of any and all potentials. Grid bias, plate voltage, and meter sensitivity, are independently adjustable from three separate controls. The meter is used for all functions, including measurement of transconductance, emission of diodes and rectifiers. The functional switches set up the correct connections from all of the sockets for the particular type of potential required on each tube base pin.

VOLTAGE REGULATOR TEST SECTION: A Testing section for voltage regulator tubes such as the VR105 through VR 150 and the type 874, is available in the tube checker. This section includes a separate d-c power supply which is switched into the circuit when the SELECTOR is indexed to the VOLTAGE REGULATOR TESTS ONLY position. The filtered d-c potential available from this supply is applied to the regulator tube under test, and can be varied in amplitude by rotation of the FILAMENT VOLTAGE and LINE controls. Starting or firing voltage can first be measured and then the regulation of the tube can be determined under the current range specified by the tube manufacturer. Both of these tests are important in determining the regulating ability of the tube in question.

The meter is connected into the circuit as a 200 volt d-c voltmeter for all voltage regulator tests.

OPERATION

GENERAL: Refer to the Panel of the Model 798. The sockets are all grouped along the top edge of the panel. Reading from left to right these include a combination 4-5-6 prong socket, a combination small and large 7 prong socket, an octal socket, and an acorn socket. Below and between the 7 prong and octal sockets is mounted a miniature socket. This is the group of regular sockets and these are always used unless specific instructions are noted in the Tube Data to use the special octal, loctal, and miniature sockets marked with a large letter A. These three A sockets along with a spare loctal and a spare miniature socket are in the right hand upper section of the panel. Directly below the octal and the octal A sockets are mounted grid and plate pin jacks respectively. These are used with the top cap connector leads stored in the lead compartment. Where tubes are encountered having top cap connectors, one or both of these leads may be used. When not required these leads should be kept in the lead compartment to avoid damage and to keep them out of the way of the various controls.

Red and green jewel pilot lamps are used, the red jewel lamp being an overload indicator. This lamp will flash when the tube tester or the tube under test is overloaded and the operator should immediately turn off the tube tester if this lamp glows and continues to glow brightly when a tube is inserted in one of the sockets. The green jewel lamp is a regular pilot, and will indicate at all times when the tube tester is turned on.

CONTROLS: The filament voltage switch is prominently marked and is mounted to the left of the meter. This is the first control to set at all times. The operator must be sure this is set correctly to avoid damage to the tube. The switch to the right of the meter marked "SELECTOR" is a combination on-off switch for the Tube Tester and Voltage Regulator Tester. When an operator is through testing a tube, this switch should be indexed to the OFF position.

In a line across the panel are 5 controls, 4 of these marked A through D. These 4 controls set up the correct type of potential and correct bias and sensitivity. The plate voltage control prominently marked in the center of the panel applies one of three plate voltages to the tube under test. This is always kept in the HIGH or NORMAL position unless one of the other two positions is specified in the column "REMARKS" on the Tube Data Charts.

The A control sets up the correct grid voltage for all mutual conductance measurements. On rectifiers and diodes this control is used for the correct plate loading.

The B and C switches are used to connect the tube base pins to the correct portion of the tube testing circuit. In other words, these switches select the correct type of potential to be applied to the tube.

The D control functions as a sensitivity control for tube test readings.

The switch marked SHORT TESTS disconnects all of the tube electrodes from the tube testing circuit, and connects them into the short test circuit. This switch should be rotated through the 4 numbered positions for short testing all tubes, and turned to the cathode leakage position for checking cathode-heater shorts on those tubes manufactured with indirectly heated cathodes. It must be indexed to the TUBE TEST position for all G_m or emission readings. When checking for shorts, the operator should watch the neon lamp "SHORT INDICATOR" to the right of the "OVERLOAD INDICATOR." Some tubes have inter-pin direct connections inside the tubes and this lamp will flash on some of the short test positions when checking tubes of this type. The positions on which the lamp should glow are indicated in the column headed REMARKS on the Tube Test Data Charts.

The G_m RANGE switch is located in the lower center section of the panel and must be indexed to the correct range both for red-green scale and mutual conductance readings.

The LINE CONTROL is used for setting the transformer potentials to the correct values. This is used in conjunction with the LINE CHECK toggle switch and the meter, wherein the instrument pointer should be set to the center scale arrow marked "LINE CHECK" using this line control. This line check reading must always be measured after the tube is in the socket to correct for any drop in transformer potentials due to tube loading.

There are three other toggle switches used for various purposes. The extreme right hand switch is of the momentary type, and applied to G_m signal when measuring mutual conductance or when taking red-green scale readings, on tubes of the amplifier type. It is not used for rectifier and diode types. The toggle switch to the left of the G_m range switch is indexed in the UP position for all amplifier types, and in the DOWN position for rectifer and diode types. The toggle switch to the left of the amplifier switch is used on double plate rectifiers, and diodes and for double section amplifier tubes. Where readings are listed in the REMARKS column, P_1 and P_2, this switch is used for the normal and second plate readings. It should always be kept in the NORMAL position except when taking these second plate readings.

TUBE TEST DATA CHARTS: Amplifier types of vacuum tubes can be tested using RED-GREEN (Good-Bad) scale indications or by using MUTUAL CONDUCTANCE (G_m) scale indications in conjunction with the G_m range switch for three ranges calibrated: 0-3,000; 0-6,000 and 0-12,000 micromhos.

GOOD-BAD readings of the more frequently encountered types are listed in the Tube Test Data Charts in the cover of the instrument; a supplementary Tube Test Data Chart lists outdated and seldom encountered types. A special Chart is included covering GOOD-BAD readings on some tubes frequently encountered in railroad communications.

G_m Readings are listed in the Tube Test Data Charts on pages 9-14 of this book.

On rectifier and diode types where emission readings only are required, Good-Bad indications are always used. However, readings on these tubes are duplicated in the G_m Data Charts so that the operator can use either arrangement and have available in one table, readings on all of the types.

Referring to the Data Charts in the cover, the first column marked TUBE TYPE lists the R.M.A. number for the particular tube in question. Where tubes have more than one section such as twin-triodes, double listings are required as indicated by the brackets. The second column lists the HEATER or FILAMENT VOLTAGE.

The CONTROL SETTINGS for the knobs marked A, B, C, and D are listed in the 4 columns under this heading. These should all be set correctly before inserting the tubes in the socket. The next column lists the correct position of the G_m range switch. On diode and rectifier types, this switch is not used, and it may remain in any position during the diode or rectifier test.

The last column headed REMARKS indicates low or medium plate voltages where they are required, any short test positions where the lamp will light due to internal pin connections in the tube under test, and pertinent data on double section tubes.

Note that a heavy star appears in front of the filament voltage listings for some of the tubes. Referring to the notes at the bottom of the chart, this star indicates that the particular tube in question is to be checked in the A socket and NOT in the regular socket. All so-called REGULAR SOCKETS are mounted to the left of the acorn socket. The A sockets are to the right of this acorn socket.

The Data Charts for the Mutual Conductance readings are on pages 9 through 14 of this book. The columns and headings through the "G_m Range" are for the same as those listed in the tube data chart in the cover of the tube checker. The next column headed "Normal G_m" lists the normal mutual conductance for the tube in question. By comparing this reading with that obtained on the Model 798 the operator can determine the condition of the tube and note how much above or below the normal value the tube happens to be. The column headed "REMARKS" is the same as that listed in the Tube Data Charts in the cover of the device.

DATA CHART ABBREVIATIONS: Certain abbreviations have been used in listing the Tube Data. Most of these are found in the column headed "Remarks". The operator should become familiar with these abbreviations as it will help considerably in following the test procedure.

Cap	Tube Top Cap Connector
Conv	Converter
Di	Diode
G_m	Mutual Conductance (Transconductance)
Hex	Hexode
Norm	Normal. This is the normal value for good tubes where the indications do not conform to the red-green scale or the mutual conductance scale.
Pe	Pentode
Rect	Rectifier
Lights on	Short test neon lamp glows when short test switch is on these positions, indicating internal tube connections.

Tr	Triode
Tw Pe	Twin Pentode
Tw Tr	Twin Triode
★	Test in A Socket

TUBE TESTING SECTION:

1. Set up the Model 798 near a 105-125 volt 60 cycle outlet.

2. Open the cover and then open the lead compartment. Pull out the line cord and inspect the plug to be sure there is a fuse in each side.

3. Plug into the a-c line and turn the SELECTOR switch to the ON position. The green pilot lamp should light. If it does not, examine the lamp and the fuses in the plug.

4. Pull the LINE CHECK switch and be sure the instrument pointer can be set to the LINE CHECK position, by adjusting the LINE CONTROL. The tube testing section is then ready for operation.

VOLTAGE REGULATOR SECTION:

1. Refer to steps one and two under TUBE TESTING SECTION above.

2. Index the FILAMENT VOLTAGE Switch to any position between 1.1 and 35 volts. Rotate the LINE CONTROL to the extreme counter-clockwise position.

3. Plug into a-c line, and turn the SELECTOR switch to the VOLTAGE REGULATOR TESTS ONLY position. The green pilot light should glow.

4. Allow approximately a 30 second warm-up period for the internal rectifier tube. As this tube comes up to temperature, the meter pointer will move slowly up scale. As soon as the pointer has stopped moving, the voltage regulator test section is ready for operation.

OPERATIONAL PROCEDURE—RED-GREEN SCALE READINGS:

1. Locate the type number of the tube to be tested.

2. Set the FILAMENT VOLTS control first, and then the A, B, C, and D controls to the correct number as listed in the Tube Test Data Charts.

3. Index the SHORT TEST switch to position 4 and with the tester turned on, plug the tube into the correct socket. If a star appears in front of the filament voltage figure, insert the tube in the corresponding A socket.

4. Pull the LINE CHECK switch and adjust the LINE CONTROL until the instrument pointer indicates in the center of the LINE CHECK arrow.

5. Refer to the REMARKS column to see if there is a notation for low or medium plate voltage (E_p). If there is such a notation, index the PLATE VOLTAGE switch correctly.

6. Refer to the NORMAL PLATE — SECOND PLATE (P_1-P_2) toggle switch and be sure this is indexed to the normal plate position unless indicated otherwise in REMARKS. Likewise, refer to the AMPLIFIER-RECTIFIER switch and be sure this is indexed correctly for the type of measurement required.

7. Rotate the SHORT TEST switch through the positions 4-3-2-1 watching the neon lamp. If the lamp lights on any of these positions, refer to the column headed REMARKS to see if there are internal connections for the particular tube under test. If so, there will be a notation such as "Lights on 1 and 2." If the tube lights on other positions, it should be discarded as short circuited. If the tube has a cathode, rotate the SHORT TEST switch to the cathode leakage position and discard the tube if the SHORT INDICATOR lights showing a heater to cathode short circuit.

8. Set the G_m range switch to the correct position as listed in the next column in the Data Chart and index the SHORT TEST switch to the TUBE TEST position.

9. Pull the G_m signal switch, and note the condition of the tube as passed on the red-green scale. When the pointer will not come up to the green section, the tube should be discarded as unfit for service. If the pointer continues to move up scale, as this switch is depressed, this indicates that the tube has not come up to its normal temperature and the tube should be allowed to heat up until the readings stabilize.

10. Diodes do not check in green section. A special acceptance point will be noted about 1/3 the way up on the red scale.

11. Pull the LINE CHECK switch and recheck the line voltage. If any correction is required again, measure the tube condition, pulling the G_m signal switch.

12. When rectifiers and diodes are tested, they are checked on medium and low plate voltage positions. Refer to the REMARKS column for these settings. Index the AMPLIFIER-RECTIFIER switch to the RECTIFIER and DIODES position.

Note

WHERE TWO DIFFERENT SETTINGS OF THE A, B, C, AND D CONTROLS ARE REQUIRED FOR TWO SECTIONS OF A TUBE, THESE CONTROLS SHOULD NOT BE CHANGED UNLESS THE TUBE TESTER IS TURNED OFF, OR THE SHORT TESTS SWITCH IS INDEXED TO ONE OF THE SHORT TEST POSITIONS AND NOT TO THE TUBE TEST POSITION. THE TUBE MAY BE DAMAGED IF THESE CONTROLS ARE MANIPULATED WITH THE TUBE IN THE SOCKET AND THE SHORT TEST SWITCH IN THE TUBE TEST POSITION.

IF THE OVERLOAD INDICATOR GLOWS

DURING ANY OF THESE OPERATIONS, THE TUBE TESTER SHOULD BE IMMEDIATELY TURNED OFF OR THE TUBE REMOVED FROM THE SOCKET. THE COMPLETE PROCEDURE SHOULD BE REPEATED, CHECKING ALL THE CONTROLS AND TESTING THE TUBE FOR SHORTS.

THE MUTUAL CONDUCTANCE READINGS:

a. Refer to the Test Data Charts on pages 9 through 14 for the Mutual Conductance settings.

b. Follow the procedure outlined in Operational Procedure on page 6.

c. Pull the G_m signal switch and note the mutual conductance of the tube as read in micromhos on the lower or inside scale. Use the correct set of figures as indicated by the position of the G_m range switch. Pull the line check switch and recheck the line votlage. If any correction is required, again measure the mutual conductance.

d. Compare the meter reading with that in the column headed "Normal G_m."

e. When rectifiers and diodes are tested, these tubes are checked on MEDIUM AND LOW plate voltage positions. Refer to the "Remarks" column for these settings. Be sure the AMPLIFIER-RECTIFIER switch is indexed to the RECTIFIER-DIODE position. The readings on these tubes are emission readings, and therefore, the G_m SIGNAL and RANGE switches are not used. On rectifiers be sure to recheck the line voltage before noting the condition of the tube on the red-green scale. Rectifier loading of the transformer will require an appreciable readjustment of the line voltage control.

f. WHERE TWO DIFFERENT SETTINGS OF THE A, B, C, AND D CONTROLS ARE REQUIRED FOR TWO SECTIONS OF A TUBE, THESE CONTROLS SHOULD NOT BE CHANGED UNLESS THE TUBE TESTER IS TURNED OFF, OR THE SHORT TESTS SWITCH IS INDEXED TO ONE OF THE SHORT TEST POSITIONS AND NOT TO THE TUBE TEST POSITION. THE TUBE MAY BE DAMAGED IF THESE CONTROLS ARE MANIPULATED WITH THE TUBE IN THE SOCKET AND THE SHORT TEST SWITCH IN THE TUBE TEST POSITION.

g. IF THE OVERLOAD INDICATOR GLOWS DURING ANY OF THESE OPERATIONS, THE TUBE TESTER SHOULD BE IMMEDIATELY TURNED OFF OR THE TUBE REMOVED FROM THE SOCKET. THE COMPLETE PROCEDURE SHOULD BE REPEATED CHECKING ALL OF THE CONTROLS AND TESTING THE TUBE FOR SHORTS.

VR TYPES: The **VR-150-30**, also listed as a type OD3, is a cold glow discharge gas regulator tube, with a current regulating range from 5 to 30 milliamperes. Over this range the regulated potential should hold within 2 volts. To test this tube proceed as follows:

1. Set FILAMENT VOLTS to 13 or 27.5.
2. Set LINE CONTROL to extreme counter-clockwise position.
3. Index B switch to 2.
4. Index C switch to 4.
5. Set SELECTOR to "Voltage Regulator Tests Only", and allow 30 second warm-up time for internal rectifier.
6. Place tube in Regular Octal socket. The voltage as read on the meter should be below 150 volts, under average line conditions.
7. Rotate the LINE CONTROL slowly in a clockwise direction watching the voltmeter. As the pointer approaches the 160 volt mark, the tube should fire as indicated by a sudden drop in meter reading to 150 volts. The tube may be checked visually also, as a glow will appear in the tube when it fires.
8. Limits on firing are from 155 to 185 volts. If full rotation of the LINE CONTROL will not fire the tube, or will not bring the instrument pointer up to the 185 mark, then return the LINE CONTROL to the extreme counter-clockwise position and increase the FILAMENT VOLTS one position and bring the pointer up to 185 volts by rotation of the LINE CONTROL.
9. If the tube is within starting voltage limits, set the LINE CONTROL to a position just above the firing point and note the meter reading. This should be close to 150 volts. Rotate the FILAMENT VOLTS switch to the 115 volt position. The instrument reading should not change more than 2 volts.

The **VR-105** sometimes listed as the OC3 may be tested following the same procedure as that outlined above for the VR-150:

1. Set FILAMENT VOLTS to 1.1.
2. LINE CONTROL set to minimum (counter-clockwise).
3. Index B switch to 2.
4. Index C switch to 4.
5. Index SELECTOR for VR tests and place tube in regular octal socket.
6. Rotate LINE CONTROL and note firing potential. Limits are from 110 to 133 volts.
7. If tube fires within limits, note regulation by increasing FILAMENT VOLTS to 85. Regulation should be within 1 volt.

PRECAUTIONS IN TESTING VR TUBES

(1) Don't insert tube in socket until steps one through five have been completed.

(2) Be sure SELECTOR is indexed to "VOLTAGE REGULATOR TYPES ONLY" before attempting to test any VR tube.

(3) Don't change position of B & C switches when the tube is in the socket.

(4) Keep the NORMAL PLATE-SECOND PLATE toggle switch in the NORMAL

PLATE position, and the Amplifier-Rectifier toggle Switch in the Amplifier position.

(5) Keep the AMPLIFIER-RECTIFIER toggle switch in the AMPLIFIER position.

(6) The A and C controls, the SHORT TEST switch, the PLATE VOLTAGE and G_m switches are not used for VR tests.

MAINTENANCE

PILOT LAMPS: Two 6.3 volt, brown bead miniature base lamps are used, one in the Pilot Lamp socket, and one in the Overload Indicator socket. The overload lamp will show a very slight indication when the tester is turned on, and will show a short interval glow when a cold, heater type tube is first inserted in the tester.

Replace burned out lamps using a 6.3 volt brown bead miniature bayonet type.

NEON LAMPS: To be sure this lamp, marked Short Indicator, is operating: check a filament tube, i.e., a directly heated tube or one having no cathode. Index the Short Tests switch to Cathode Leakage. The lamp should light. If it does not glow, first be sure it has not worked loose in the socket before replacing.

TUBES: Two miniature type 3A4 tubes are used; one is the signal voltage generator tube, and the other is the short test rectifier tube. They are mounted under the panel in sockets with spring clamp shield covers.

If no meter deflection is noted when the G_m signal switch is pulled, but the Model 798 operates correctly on diode or rectifier tests, then the G_m signal tube should be examined. The panel assembly must be removed from the case in order to examine this tube.

To remove the panel assembly from the case: (1)—Remove the panel bracket screw from the bottom of the case (Refer to Figure 1). (2)—Remove the four corner panel to case screws. (3)—Lift the panel assembly carefully and feed aproximately two feet of line cord through the rubber grommet in the accessory compartment partition. The panel assembly can then be set face down on the bench.

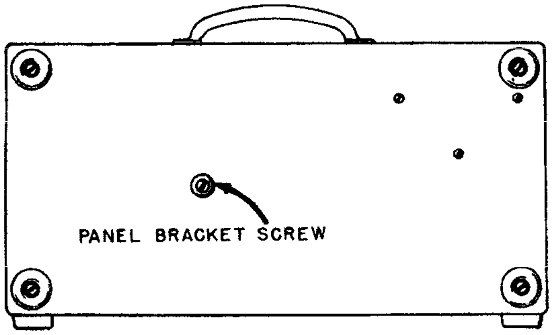

Figure 1—Bottom View of Case Showing Location of Panel Bracket Screw.

Examine the G_m signal tube and check across pins 1 and 7 for continuity using the low or x1 ohmmeter range. If the filament is open, replace with a new 3A4 tube. No adjustments are necessary.

If no "short test" indications are noted, and the short test neon lamp has been checked, examine the short test rectifier tube next to the G_m signal tube. Inspect this tube as noted above and replace it if necessary.

Replace the panel assembly in the case. **Be sure to replace all four panel bracket screws and bottom bracket screw.**

FUSES: Standard 2 Amp automotive type fuses are used in the line cord plug. To remove push the fuse out of the plug using a pencil or one of the test prods.

PREVENTIVE MAINTENANCE

PRECAUTIONS: The following precautions should be observed when testing tubes in the Model 798.

(1) DON'T plug the Model 798 into a DC line. Be sure the power line to be used operates at a potential of 105 to 125 volts, 60 cycles.

(2) DON'T insert a tube in the socket before setting the FILAMENT VOLTS switch, and the A, B, C, and D controls.

(3) DON'T insert a tube in the socket with the SHORT TESTS switch in the TUBE TEST position. Index this switch to position 4 so that all short testing can be completed before setting the switch to the TUBE TEST position.

(4) DON'T change the position of the FILAMENT VOLTS switch when a tube is in one of the test sockets.

(5) DON'T change the position of the A, B, C, or D controls, when the SHORT TESTS switch is indexed to the TUBE TEST position.

(6) DON'T fail to change the setting of the PLATE VOLTAGE switch to MEDIUM or LOW, when listed in the "Remarks" column.

(7) DON'T fail to keep the $P_1 — P_2$ switch in the NORMAL PLATE position at all times, except when otherwise specified in the "Remarks" column.

(8) DON'T fail to keep the AMPLIFIER-RECTIFIER switch in the AMPLIFIER position except when making emission tests on rectifier and diodes.

(9) DON'T fail to shut off the device when through using it, and return all leads and line cords to the side compartment.

SPARE SOCKETS—Two unwired spare sockets are included. These are the loctal socket in the right hand corner, and the miniature socket nearest this loctal socket. These are available for new tube types that might require special electrode connections.

MUTUAL CONDUCTANCE TEST DATA

Tube Type	Filament Volts	CONTROL SETTINGS				Gm Range	Normal Gm	REMARKS
		A	B	C	D			
01A	5	30	3	5	0	3000	800	
1A3	1.5	50	1	9	50	Diode		LO. Ep, Lights on 1 & 2
1A4P	2.0	30	3	1	0	3000	750	Hi. Ep
1A5-G	1.5	20	1	2	23	3000	850	Med. Ep
1A6	2.0	30	10	2	42	3000	G-B Scale	Hi. Ep
1A7	1.5	30	2	2	50	3000	G-B Scale	Med. Ep
1B4-P	2.0	30	3	1	0	3000	650	Hi. Ep
1B5	2.0	10	6	6	23	3000	575	Hi. Ep, Tr.
	2.0	50	5	11	50	Diode		LO. Ep, P_1 & P_2
1B7GT	1.5	20	2	2	43	3000	G-B Scale	Med. Ep
1C5G	1.5	30	1	2	28	3000	1550	Med. Ep
1C6	2.0	20	10	2	36	3000	G-B Scale	Hi. Ep
1C7G	2.0	30	2	2	36	3000	G-B Scale	Hi. Ep
1D5GP	2.0	30	1	2	0	3000	750	Hi. Ep
1D7G	2.0	30	2	2	39	3000	G-B Scale	Hi. Ep
1D8G	1.5	20	7	2	10	3000	925	Med. Ep, Pe.=P_1
	1.5	0	7	2	10	3000	575	Med. Ep, Tr.=P_2
	1.5	50	8	8	50	Diode		LO. Ep, Di.=P_2
1E4	1.5	10	1	1	18	3000	825	Med. Ep
1E5GP	2.0	30	1	2	0	3000	650	Hi. Ep
1E7G	2.0	20	4	3	46	3000	1425	P_1 & P_2, Tw. Tr.
1F4	2.0	20	4	3	28	3000	1700	Hi. Ep
1F5G	2.0	20	1	2	15	3000	1700	Hi. Ep
1F6	2.0	0	7	3	30	3000	650	Hi. Ep
	2.0	50	5	3	50	Diode		Use P_2, LO. Ep
	2.0	50	3	3	50	Diode		Use P_1, LO. Ep
1F7G	2.0	15	2	6	0	3000	650	Pe.
	2.0	50	1	9	50	Diode		LO. Ep, P_1 & P_2
1G4G	1.5	20	1	1	23	3000	825	Med. Ep
1G5	2.0	30	1	2	5	3000	1550	Hi. Ep
1G6GT	1.5	0	7	3	18	3000	675	Med. Ep, P_1 & P_2
1H4	2.0	30	1	1	26	3000	900	Hi. Ep
1H5	1.5	5	1	11	2	3000	275	Med. Ep, Tr.
	1.5	50	1	11	50	Diode		LO. Ep, Use P_2
1H6	2.0	10	1	6	23	3000	575	Hi. Ep
1J5	2.0	30	1	2	0	3000	950	Hi. Ep
1J6	2.0	0	7	3	35	3000	G-B Scale	Hi. Ep, P_1 & P_2 Tw. Tr.
1L4	1.5	0	4	5	23	3000	1025	Med. Ep
1LA4	1.5	20	5	1	23	3000	850	Med. Ep
1LA6	1.5	20	5	3	49	3000	G-B Scale	Med. Ep
1LB4	1.5	20	5	1	10	3000	925	Med. Ep
1LC5	1.5	5	5	10	0	3000	775	Med.Ep,Lights on 1

Tube Type	Filament Volts	CONTROL SETTINGS				Gm Range	Normal Gm	REMARKS
		A	B	C	D			
1LC6	1.5	20	5	3	50	3000	G-B Scale	Med. Ep
1LD5	1.5	10	5	1	5	3000	575	Med. Ep
1LE3	1.5	0	5	1	10	3000	1300	Med. Ep
1LH4	1.5	5	5	1	2	3000	275	Med. Ep
1LN5	1.5	0	5	10	5	3000	800	Med.Ep,Lights on1
1N5G	1.5	0	1	2	0	3000	750	Med. Ep
1N6	1.5	20	4	2	19	3000	800	Med. Ep
	1.5	50	4	2	50	Diode		LO. Ep, Use P_2
1P5GT	1.5	0	1	2	0	3000	750	Med. Ep
1Q5G	1.5	10	1	2	22	6000	2200	Med. Ep
1R4/1294	1.5	50	2	2	50	Diode		LO. Ep
1R5	1.5	15	8	5	43	3000	G-B Scale	Med. Ep, Use P_2
1S4	1.5	20	11	9	22	3000	1575	Med. Ep, Lights on 2 & 1
1S5	1.5	0	2	3	0	3000	625	Med. Ep, Pe.
	1.5	50	10	5	50	Diode		LO. Ep
1SA6	1.5	0	3	5	0	3000	970	Med. Ep
1T4	1.5	0	4	5	25	3000	900	Med. Ep
1T5GT	1.5	20	1	2	20	3000	1150	Med. Ep
1-V	6.3	12	3	8	0	Rect.		Med. Ep
2A3	2.5	50	3	5	44	6000	5250	
2A5	2.5	40	9	2	40	3000	2500	
2A6	2.5	5	1	6	32	3000	1100	Tr.
	2.5	50	12	9	50	Diode		LO. Ep, P_1 & P_2
2A7	2.5	30	3	3	34	3000	G-B Scale	
2B7	2.5	20	2	6	18	3000	1325	Pe.
	2.5	50	8	11	50	Diode		LO. Ep, P_1 & P_2
2C22	6.3	15	1	1	32	6000	3000	
2C26	6.3	20	1	1	42	3000	2200	
2X2	2.5	50	1	1	0	Rect.		Hi. Ep, Pl. on Cap
3A4	3.3	30	8	9	19	3000	1900	Lights on 1 & 2
3A5	3.3	10	5	11	28	3000	1800	Med. Ep
3A8	3.3	0	5	11	9	3000	750	Pe. Med. Ep,
	3.3	0	5	3	46	3000	G-B Scale	Tr. Lights on 1
3B5	★ 1.5	40	2	2	33	3000	1500	Med. Ep
3B7/1291	3.3	10	5	12	36	3000	1850	P_1 Med. Ep,
	3.3	3	5	12	36	3000	1850	P_2 Tw. Tr.
3D6/1299	3.3	30	5	1	14	3000	2200	Lights on 1
3LF4	3.3	10	5	1	22	6000	2200	Med.Ep,Lights on 1
3Q4	2.5	20	11	9	29	3000	2150	Med. Ep, Lights on 1 & 2
3Q5	★ 1.5	20	2	2	17	3000	2000	
3S4	3.3	20	11	9	23	3000	1425	Med. Ep, Lights on 1 & 2

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MUTUAL CONDUCTANCE TEST DATA (continued)

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
5R4-GY	5	14	2	1	0	Rect.		Med. Ep, P_1 & P_2
5T4	5	12	2	1	0	Rect.		Med. Ep, P_1 & P_2
5U4-G	5	15	2	1	0	Rect.		Med. Ep, P_1 & P_2
5V4	5	11	2	1	0	Rect.		Med. Ep, P_1 & P_2
5W4	5	16	2	1	0	Rect.		Med. Ep, P_1 & P_2
5X3	5	14	3	4	0	Rect.		Med. Ep, P_1 & P_2
5X4	★ 5	14	4	4	0	Rect.		Med. Ep, P_1 & P_2
5Y3-GT	5	16	2	1	0	Rect.		Med. Ep, P_1 & P_2
5Y4	★ 5	16	4	4	0	Rect.		Med. Ep, P_1 & P_2
5Z3	5	13	3	4	0	Rect.		Med. Ep, P_1 & P_2
5Z4	5	11	2	1	0	Rect.		Med. Ep, P_1 & P_2
6A3	6.3	50	3	5	44	6000	5250	
6A4/LA	6.3	40	4	3	25	3000	2200	
6A5	6.3	50	8	1	46	12000	5250	Lights on 1 & K
6A6	6.3	0	1	3	37	6000	3300	
6A7	6.3	30	3	3	34	3000	G-B Scale	
6A8	6.3	30	7	2	41	3000	G-B Scale	
6AB6	6.3	0	1	1	45	3000	1800	
6AB7	6.3	5	3	8	20	12000	5000	
6AC5	6.3	0	1	1	43	6000	3400	
6AC7	6.3	5	3	8	14	12000	9000	
6AD6	6.3	0 to 50	1	5				Swing. "A" from 0 to 50 Incr. Green approx. 50%
6AD7	6.3	30	9	2	30	3000	2500	Pe.
	6.3	20	9	2	20	3000	325	Use P_2, Tr.
6AE5	6.3	50	1	1	14	3000	1200	
6AE6	6.3	5	1	1	37	3000	1000	Use P_1
	6.3	5	1	1	37	3000	950	Use P_2
6AE7	6.3	15	1	7	14	6000	3000	
6AF5	6.3	40	1	1	32	3000	1500	
6AF6	6.3	0 to 50	1	5				Swing. "A" from 0 to 50 Incr. Green approx. 50%
6AG5	★ 6.3	5	10	8	28	6000	5000	
6AG7	6.3	15	3	7	41	12000	7700	
6AK5	★ 6.3	10	10	8	32	6000	5000	
6AK6	★ 6.3	30	10	3	40	6000	2250	
6AL5	★ 6.3	45	7	9	50	Diode		LO. Ep, P_1 & P_2 Lights on 1
6AQ5	★ 6.3	10	4	8	44	6000	3700	Lights on 4 & 1
6AQ6	★ 6.3	5	2	7	30	3000	1200	Tr.
	6.3	50	8	6	50	Diode		LO. Ep, P_1 & P_2

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
6AS6	★ 6.3	5	6	8	13	6000	3500	
6AS7	★ 6.3	50	5	5	45	3000	G-B Scale	Med. Ep, Tr. #1
	6.3	50	10	1	45	3000	G-B Scale	Med. Ep, Tr. #2
6AT6	★ 6.3	5	2	7	20	3000	1200	Tr.
	6.3	50	8	6	50	Diode		LO. Ep, P_1 & P_2
6AU6	★ 6.3	10	10	8	33	12000	5200	
6B4	6.3	50	1	1	42	6000	5250	
6B5	6.3	0	9	1	48	3000	2400	
6B6	6.3	5	1	6	35	3000	1125	Tr.
	6.3	50	1	9	50	Diode		LO. Ep, P_1 & P_2
6B7	6.3	20	2	6	18	3000	1325	Pe.
	6.3	50	8	11	50	Diode		LO. Ep, P_1 & P_2
6B8	6.3	30	12	6	28	3000	1125	Pe.
	8.3	50	12	9	50	Diode		LO. Ep, P_1 & P_2
6BA6	★ 6.3	10	10	3	30	6000	4400	
6BE6	★ 6.3	15	8	8	32	6000	G-B Scale	
6BF6	★ 6.3	20	2	7	37	3000	1900	Tr.
	6.3	50	8	8	50	Diode		LO. Ep, P_1 & P_2
6C4	★ 6.3	15	10	11	33	3000	2200	
6C5	6.3	10	1	1	32	6000	2100	
6C6	6.3	15	9	2	24	3000	1225	
6C7	6.3	15	2	6	28	3000	1250	Tr.
	6.3	50	3	9	50	Diode		LO. Ep, P_1 & P_2
6C8	6.3	5	7	6	23	3000	1600	Use P_1
	6.3	5	7	2	23	3000	1600	Use P_2, Lights on 2
6D6	6.3	20	9	2	27	3000	1600	
6D8G	6.3	30	7	2	38	3000	G-B Scale	
6E5	6.3	10	1	3	50	3000	G-B Scale	
6E6	6.3	40	1	3	45	6000	2800	
6F5	6.3	5	1	2	30	3000	1500	
6F6	6.3	30	1	2	34	3000	2500	
6F7	6.3	10	2	3	8	3000	1100	Pe.
	6.3	40	3	8	10	3000	500	Tr.
6F8	6.3	10	7	6	20	6000	2600	Use P_1
	6.3	10	7	2	20	6000	2600	Use P_2, Lights on 2
6G6	6.3	30	1	2	37	3000	2300	
6H4	6.3	50	1	2	50	Diode	G-B Scale	LO. Ep
6H6	6.3	50	1	4	50	Diode	G-B Scale	LO. Ep, P_1 & P_2
6J4	★ 6.3	5	11	7	28	12000	10000	5 min. warm-up time
6J5	6.3	15	1	1	36	6000	2600	
6J6	★ 6.3	5	6	11	24	12000	5300	P_1 & P_2, Tw. Tr.
6J7	6.3	15	1	2	22	3000	1225	
6J8	6.3	20	7	2	30	3000	1600	
6K5	6.3	5	1	1	25	3000	1475	
6K6	6.3	30	1	2	32	3000	2300	

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MUTUAL CONDUCTANCE TEST DATA (continued)

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
6K7	6.3	20	1	2	25	3000	1450	
6K8	6.3	20	7	2	47	6000	G-B Scale	Hex.
	6.3	0	7	2	42	6000	G-B Scale	Tr.
6L5	6.3	15	1	1	35	3000	1900	
6L6	6.3	10	1	2	44	12000	6000	Med. Ep
6L7	6.3	20	1	2	7	3000	1100	
6N6	6.3	0	1	2	20	3000	2400	
6N7	6.3	10	7	3	43	3000	1600	P_1 & P_2
6P5GT/G	6.3	20	1	1	30	3000	1450	
6Q6	6.3	5	1	11	19	3000	1050	Tr.
	6.3	50	1	11	50	Diode		LO. Ep, Use P_2
6Q7	6.3	10	1	6	35	3000	1200	Tr.
	6.3	50	1	9	50	Diode		LO. Ep, P_1 & P_2
6R7	6.3	15	1	6	35	3000	1900	Tr.
	6.3	50	1	9	50	Diode		LO. Ep, P_1 & P_2
6S7	6.3	20	1	2	26	3000	1750	
6S8	★ 6.3	5	7	8	34	3000	1100	Tr.
	6.3	50	12	1	50	Diode		LO. Ep, P_1 & P_2, Dl. 2 & 3
	6.3	50	2	7	50	Diode		LO. Ep, Lights on K
6SA7	6.3	20	11	2	40	6000	G-B Scale	
6SC7	★ 6.3	10	8	5	50	3000	1375	P_1 & P_2, Tw. Tr.
6SD7GT	6.3	10	3	8	27	6000	4250	
6SF5	★ 6.3	5	1	4	30	3000	1500	
6SF7	★ 6.3	20	6	2	28	3000	2050	Pe.
	6.3	50	6	9	50	Diode		LO. Ep
6SG7	6.3	10	3	8	30	6000	4700	
6SH7	6.3	5	3	8	32	6000	4900	
6SJ7	6.3	20	3	8	28	3000	1650	
6SK7	6.3	20	3	8	25	3000	2000	
6SL7	★ 6.3	5	10	1	33	3000	1600	Tr. 1
	6.3	5	7	5	33	3000	1600	Tr. 2
6SN7	★ 6.3	20	10	1	50	6000	2600	Tr. 1
	6.3	20	7	5	50	6000	2600	Tr. 2
6SQ7	★ 6.3	5	6	6	32	3000	1100	Tr.
	6.3	50	6	9	50	Diode		LO. Ep, P_1 & P_2
6SR7	★ 6.3	20	6	6	37	3000	1900	Tr.
	6.3	50	6	9	50	Diode		LO. Ep, P_1 & P_2
6SS7	6.3	20	3	8	25	3000	1850	
6ST7	★ 6.3	20	6	6	37	3000	1900	Tr.
	6.3	50	6	9	50	Diode		LO. Ep, P_1 & P_2
6T7G	6.3	5	1	6	25	3000	1050	Tr.
	6.3	50	1	9	50	Diode		LO. Ep, P_1 & P_2

Tnbe Typo	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
6U5/6G5	6.3	0	1	3	42	3000	G-B Scale	
6U6GT	6.3	50	1	2	48	12000	6200	
6U7G	6.3	20	1	2	25	3000	1600	
6V6	6.3	30	1	2	44	6000	4100	
6V7G	6.3	25	1	6	19	3000	1100	Tr.
	6.3	50	1	9	50	Diode		LO. Ep, P_1 & P_2
6W5G	6.3	12	1	4	0	Rect.		Med. Ep, P_1 & P_2
6W7G	6.3	15	1	2	22	3000	1225	
6X4	★ 6.3	14	6	8	0	Rect.		Med. Ep, Use P_1
	6.3	14	6	9	0	Rect.		Med. Ep, Use P_2
6X5	6.3	13	1	4	0	Rect.		Med. Ep, P_1 & P_2
6Y5	6.3	13	8	2	0	Rect.		Med. Ep, P_1 & P_2
6Y6	6.3	50	1	2	50	12000	6000	
6Y7	6.3	0	7	3	40	3000	G-B Scale	P_1 & P_2
6Z7G	6.3	0	7	3	42	3000	G-B Scale	P_1 & P_2, Tw. Tr.
6ZY5G	6.3	13	1	4	0	Rect.		Med. Ep, P_1 & P_2
7A4	6.3	15	6	1	36	6000	2600	
7A5	6.3	30	6	1	45	12000	6000	
7A6	6.3	50	8	1	50	Diode	G-B Scale	LO. Ep, P_1 & P_2
7A7	6.3	20	6	3	28	3000	2000	
7A8	6.3	40	6	3	43	3000	G-B Scale	
7B4	6.3	5	6	1	34	3000	1500	
7B5	6.3	40	6	1	39	3000	2300	
7B6	6.3	5	2	9	34	3000	1100	Lights on 1, Tr.
	6.3	50	8	8	50	Diode		LO. Ep, P_1 & P_2
7B7	6.3	20	6	3	30	3000	1700	
7B8	6.3	30	6	3	34	3000	G-B Scale	
7C4/1203A	6.3	50	2	2	50	Diode		LO. Ep
7C5	6.3	25	6	1	37	6000	3700	
7C6	6.3	5	2	9	35	3000	1325	Lights on 1
7C7	6.3	10	6	3	13	3000	1300	
7E5/1201	★ 6.3	5	5	6	21	6000	3075	Lights on 4, 1 & K
7E6	6.3	15	2	9	35	3000	1900	Lights on 1, Tr.
	6.3	50	8	8	50	Diode		LO. Ep, P_1 & P_2
7E7	6.3	20	6	4	24	3000	1300	Pe.
	6.3	50	7	1	50	Diode		LO. Ep, P_1 & P_2
7F7	6.3	5	8	7	45	3000	1600	P_1 & P_2, Tw. Tr.
7F6	★ 6.3	5	6	5	3	12000	5000	Lights on K
7G7/1232	6.3	5	6	3	0	12000	4500	
7G8/1206	6.3	10	12	7	18	6000	4200	
7H7	6.3	15	6	3	40	6000	3800	
7J7	6.3	0	7	7	34	3000	G-B Scale	Tr.
	6.3	20	6	8	40	3000	G-B Scale	Hep.
7K7	6.3	5	8	10	35	3000	1600	Tr.
	6.3	50	8	8	50	Diode		LO. Ep, P_1 & P_2
7L7	6.3	10	6	3	27	6000	3100	
7N7	6.3	10	6	7	26	6000	2600	P_1 & P_2, Tw. Tr.

MUTUAL CONDUCTANCE TEST DATA (continued)

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
7Q7	6.3	30	6	7	33	3000	G-B Scale	
7R7	6.3	10	6	4	33	6000	3200	
	6.3	50	7	1	50	Diode		LO. Ep, P_1 & P_2
7S7	6.3	20	6	3	32	3000	G-B Scale	
7V7	6.3	10	6	3	30	12000	5800	
7W7	6.3	10	6	6	28	12000	5800	
7Y4	6.3	13	3	4	0	Rect.		Med. Ep, P_1 & P_2
7Z4	6.3	16	3	4	0	Rect.		Med. Ep, P_1 & P_2
10	7.5	40	3	5	23	3000	1330	
12A	5.0	40	3	5	21	3000	1800	
12A5	13	50	5	6	36	3000	2400	Lights on 1 & K
12A6	13	25	1	2	36	6000	3000	
12A7	13	40	2	1	20	3000	975	Use P_1 No K
	13	10	2	1	0	Rect.		Med. Ep, Use P_2 LeakTest
12A8	13	30	7	2	35	3000	G-B Scale	
12AH7GT	13	10	9	7	0	3000	1000	P_1 Lights on 4 & K
	13	10	9	7	39	3000	1000	P_2
12AT6	★ 13	5	2	7	20	3000	1200	Tr.
	13	50	8	6	50	Diode		LO. Ep, P_1 & P_2
12B7/14A7	13	20	6	3	26	3000	2000	
12B8	13	20	11	11	27	3000	1800	Use P_1, Pe.
	13	0	11	11	15	3000	2400	Use P_2, Remove Grid Cap Lead, Tr.
12BA6	★ 13	10	10	3	30	6000	4400	
12BE6	★ 13	15	8	8	32	6000	G-B Scale	
12BF6	★ 13	20	2	7	37	3000	1900	Tr.
	13	50	6	8	50	Diode		LO. Ep, P_1 & P_2
12C8	13	25	12	6	26	3000	1325	Pe.
	13	50	12	9	50	Diode		LO. Ep, P_1 & P_2
12F5	13	5	1	2	30	3000	1500	
12H6	13	50	1	4	50	Diode	G-B Scale	LO. Ep, P_1 & P_2
12J5	13	15	1	1	36	6000	2600	
12J7GT	13	15	1	2	22	3000	1225	
12K7	13	20	1	2	25	3000	1450	
12K8	13	20	7	2	47	6000	G-B Scale	Hex.
	13	0	7	2	42	6000	G-B Scale	Tr.
12Q7	13	10	1	6	35	3000	1200	Tr.
	13	50	1	9	50	Diode		LO. Ep, P_1 & P_2
12SA7	13	20	11	2	40	6000	G-B Scale	
12SC7	★ 13	10	8	5	50	3000	1325	P_1 & P_2, Tw. Tr.
12SF5	★ 13	5	1	4	30	3000	1500	
12SF7	★ 13	20	6	2	28	3000	2050	Pe.
	13	50	6	9	50	Diode		LO. Ep
12SG7	13	10	3	8	35	6000	4700	
12SH7	13	5	3	8	32	6000	4900	

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
12SJ7	13	20	3	8	28	3000	1650	
12SK7	13	20	3	8	25	3000	2000	
12SL7	★ 13	5	10	1	33	3000	1600	Tr. 1
	13	5	7	5	33	3000	1600	Tr. 2
12SN7	★ 13	20	10	1	50	6000	2600	Tr. 1
	13	20	7	5	50	6000	2600	Tr. 2
12SQ7	★ 13	5	6	6	32	3000	1100	Tr.
	13	50	6	9	50	Diode		LO. Ep, P_1 & P_2
12SR7	★ 13	20	6	6	37	3000	1900	Tr.
	13	50	6	9	50	Diode		LO. Ep, P_1 & P_2
12Z3	13	11	3	8	0	Rect.		Med. Ep
14A4	13	20	6	1	45	6000	2600	
14A7/12B7	13	20	6	3	26	3000	2000	
14B6	13	5	2	9	27	3000	1100	Lights on 1, Tr.
	13	50	8	8	50	Diode		LO. Ep, P_1 & P_2, Lights on 4
14B6	13	30	6	3	34	3000	G-B Scale	
14C5	13	20	6	1	33	6000	3250	
14C7	13	10	6	3	10	3000	1625	
14E6	13	20	2	9	38	3000	1900	Lights on 1, Tr.
	13	50	8	8	50	Diode		LO. Ep, P_1 & P_2, Lights on 4
14E7	13	20	6	4	24	3000	1300	Pe.
	13	50	7	1	50	Diode		LO. Ep, P_1 & P_2
14H7	13	10	6	3	30	6000	3800	
14J7	13	30	6	3	40	3000	G-B Scale	
14N7	13	10	8	7	26	6000	2600	P_1 & P_2, Tw. Tr.
14Q7	13	30	6	7	33	3000	G-B Scale	
14R7	13	10	6	4	33	6000	3200	Pe.
	13	50	7	1	50	Diode		LO. Ep, P_1 & P_2
14S7	13	20	6	3	32	3000	G-B Scale	
14W7	13	10	6	6	28	12000	5800	
14Y4	13	13	3	4	0	Rect.		Med. Ep, P_1 & P_2
19	2.0	10	10	3	19	3000	2000	
24 A	2.5	20	1	2	24	3000	1050	
25A6	27.5	50	1	2	35	3000	2450	
25A7GT	27.5	50	7	2	26	3000	1800	Pe.
	27.5	12	7	2	0	Rect.		Med. Ep, Use P_2
25AC5	27.5	0	1	1	35	6000	3800	
25B5	27.5	40	9	2	36	3000	2300	
25B6	27.5	50	1	2	47	12000	5000	
25B8	27.5	20	11	2	28	3000	2000	Pe.
	27.5	5	11	4	34	3000	1500	Tr.
25C6	27.5	50	1	2	50	12000	6000	
25L6	27.5	30	1	2	47	6000	G-B Scale	Med. Ep
25N6	27.5	40	1	1	47	3000	2300	Use P_2
25Z5	27.5	11	8	6	0	Rect.		Med. Ep, P_1 & P_2

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MUTUAL CONDUCTANCE TEST DATA (continued)

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
25Z6	27.5	11	1	4	0	Rect.		Med. Ep, P_1 & P_2
26	1.5	30	3	5	23	3000	1100	
26A6	★ 27.5	10	10	6	17	12000	4000	
26C6	★ 27.5	20	2	7	34	3000	1900	Tr.
	27.5	50	8	6	50	Diode		LO. Ep, P_1 & P_2
26D6	★ 27.5	0	10	8	17	6000	G-B Scale	
27	2.5	20	1	3	12	3000	1000	
28D7	27.5	7	11	3	50	3000	G-B Scale	Med.Ep,Te.1 Lights
	27.5	7	11	11	50	3000	G-B Scale	Med.Ep,Te.2 on 4
30	2.0	25	3	5	16	3000	900	
31	2.0	40	3	5	16	3000	1050	
32	2.0	30	3	1	14	3000	650	
32L7	27.5	20	7	2	42	12000	6000	Med. Ep, Te.
	27.5	11	7	2	0	Rect.		Med. Ep, Use P_2
33	2.0	50	4	3	40	3000	1700	
34	2.0	20	3	1	0	3000	750	
35	2.5	20	1	2	25	3000	1050	
35A5	35	20	6	1	40	12000	5900	
35L6	35	40	1	2	47	12000	5900	
35W4	★ 35	11	10	1	0	Rect.		Med. Ep
35Y4	35	11	3	3	0	Rect.		Med. Ep, Lights on 4 & K
35Z3	35	10	2	1	0	Rect.		Med. Ep
35Z4	35	11	1	4	0	Rect.		Med. Ep
35Z5	35	10	1	4	0	Rect.		Med. Ep, Lights on 1 & K
35Z6	35	10	1	4	0	Rect.		Med. Ep. P_1 & P_2
36	6.3	15	1	2	16	3000	1100	
37	6.3	20	1	3	18	3000	1100	
38	6.3	40	1	2	24	3000	1050	
39	6.3	20	1	2	18	3000	1000	
40	5.0	10	3	5	45	3000	G-B Scale	
41	6.3	40	9	2	37	3000	2300	
42	6.3	30	9	2	30	3000	2500	
43	27.5	50	9	2	36	3000	2500	
45	2.5	50	3	5	32	3000	2175	
45Z3	47	12	6	9	0	Rect.		Med. Ep, Lights on 2 & 1
45Z5	47	10	1	4	0	Rect.		Med. Ep, Lights on 1 & K
46	2.5	40	4	3	28	3000	2350	
47	2.5	25	4	3	32	3000	2500	

Tube Type	Filament Volts	CONTROL SETTINGS A	B	C	D	Gm Range	Normal Gm	REMARKS
48	27.5	50	9	2	46	6000	3900	
49	2.0	0	5	3	10	3000	1150	
50	7.5	50	3	5	32	3000	2000	
50A5	47	30	6	1	45	12000	8200	
50B5	★ 47	30	4	8	47	6000	G-B Scale	Lights on 4 & 1
50C6	47	50	1	2	43	6000	G-B Scale	
50L6	47	30	1	2	47	6000	G-B Scale	Med. Ep
50Y6	47	11	1	4	0	Rect.		Med. Ep, P_1 & P_2
50Z7	★ 47	11	7	9	0	Rect.		Med. Ep, P_1 & P_2
53	2.5	0	1	3	32	3000	2400	
55	2.5	25	7	1	25	3000	1100	Tr.
	2.5	50	12	9	50	Diode		LO. Ep, P_1 & P_2
56	2.5	20	1	3	30	3000	1450	
57	2.5	10	9	2	5	6000	1200	
58	2.5	30	9	2	37	3000	1600	
59	2.5	40	6	3	41	3000	2500	
70L7	70	20	8	2	48	12000	7500	Med. Ep, Te.
	70	11	8	2	0	Rect.		Med. Ep, Use P_2
71A	5.0	50	3	5	31	3000	1820	
75	6.3	5	7	1	32	3000	1100	Tr.
	6.3	50	12	9	50	Diode		LO. Ep, P_1 & P_2
76	6.3	20	1	3	30	3000	1450	
77	6.3	10	9	2	5	6000	1200	
78	6.3	20	9	2	25	3000	1450	
79	6.3	0	8	3	50	6000	4000	P_1 & P_2, Tw. Tr.
80	5.0	16	3	4	0	Rect.		Med. Ep, P_1 & P_2
81	7.5	19	3	1	0	Rect.		Med. Ep
82	2.5	11	3	4	0	Rect.		Med. Ep, P_1 & P_2
83	5.0	11	3	4	0	Rect.		Med. Ep, P_1 & P_2
84	6.3	12	1	1	0	Rect.		Med. Ep, P_1 & P_2
85	6.3	25	7	1	25	3000	1100	Tr.
	6.3	50	12	9	50	Diode		LO. Ep, P_1 & P_2
89	6.3	40	9	2	33	3000	1800	
117L7	115	20	7	10	47	12000	5300	Med. Ep, Te.
	115	11	7	10	0	Rect.		Med. Ep, Use P_2
117N7	115	20	8	10	50	12000	7000	Med. Ep, No Short Test, Pe.
	115	35	8	10	0	Rect.		LO. Ep, Use P_2
117P7	115	20	8	10	47	12000	5300	Med. Ep, No Short Test, Pe.
	115	35	8	10	0	Rect.		LO. Ep, Use P_2
117Z3	★115	12	1	4	0	Rect.		Med. Ep, Lights on 2
117Z4	115	11	1	4	0	Rect.		Med. Ep
117Z6	115	10	1	4	0	Rect.		Med. Ep, P_1 & P_2

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MUTUAL CONDUCTANCE TEST DATA (continued)

		CONTROL SETTINGS						
Tube Type	Filament Volts	A	B	C	D	Gm Range	Normal Gm	REMARKS
807	6.3	40	1	3	50	6000	4300	Plate on Cap
954	6.3	15	10	5	22	3000	1400	
955	6.3	15	3	5	35	3000	2200	
956	6.3	20	10	5	27	3000	1800	
957	1.1	20	3	9	25	3000	650	
956A	1.1	20	3	9	20	3000	1200	
1005	✶ 6.3	11	2	12	0	Rect.		Med. Ep, P_1 & P_2
1609	1.1	20	4	3	19	3000	725	
1612	6.3	20	1	2	7	3000	1100	
1621	6.3	30	1	2	33	3000	2500	
1622	6.3	10	1	2	44	12000	6000	Med. Ep
1629	13	10	1	2	50	3000	G-B Scale	
1851	6.3	5	1	2	18	12000	9000	
9001	✶ 6.3	10	10	8	0	6000	1400	
9002	✶ 6.3	15	10	11	40	3000	2200	Lights on 1
9003	✶ 6.3	30	10	8	40	3000	1800	
9004	6.3	50	3	8	50	Diode	G-B Scale	LO. Ep
9005	3.3	50	1	1	50	Diode	G-B Scale	LO. Ep
9006	✶ 6.3	10	10	2	20	Diode		Med.Ep,Lights on4

Cap	Tube Top Cap Connector
Conv	Converter
Di	Diode
G_m	Mutual Conductance (Transconductance)
Hex	Hexode
Norm	Normal. This is the normal value for good tubes where the indications do not conform to the red-green scale or the mutual conductance scale.
Pe	Pentode
Rect	Rectifier
Lights on	Short test neon lamp glows when short test switch is on these positions, indicating internal tube connections.
Tr	Triode
Tw Pe	Twin Pentode
Tw Tr	Twin Triode
★	Test in A Socket